CURRICULUM VITAE

PERSONAL INFORMATION

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Mobile	**+39-347-31.71.308**
Nationality	**Italian**
Date of birth	**30/08/1977**
Place of birth	**Torre del Greco (NA)**
Civil status	**Married**

01. Employment history

(2023–today) Associate Professor in **Pedology** at the Department of Agriculture, Università degli Studi di Napoli Federico II.

(2021–2023) Tenured track **Assistant Professor** in **Pedology** at the **Department of Agriculture**, Università degli Studi di Napoli Federico II**.**

(2017–2020) Non-tenured track **Assistant Professor** in **Pedology** at the **Department of Agriculture**, Università degli Studi di Napoli Federico II**.**

(2009–2017) **Postdoctoral researcher** (research grants) at **CNR** (National Research Council) on geospatial and temporal statistical analysis of pedological, hydrological and environmental proprerties and on the development of geospatial decision support systems for monitoring and accountancy of pedo-hydrological resources (e.g. clime, LULCC, land take and soil sealing, soil water and solute balance, phytopathology).

(2014–2019) **C.E.O.** and **Founder** at **GeoProc Service s.r.l.**, an innovative startup dealing with advanced geospatial processing and calculation to provide cutting-edge services in agriculture and environmental issues. The startup has the main scope but is not limited to the dissemination of the use of WeatherProg (a sort of intellectual property described below) in regional climatic boards (in Italy and abroad) in charge of climatic data dissemination and publication (e.g. bulletins, via web, etc.). An upper-level demo application can be found at http://weatherprog4u.com/ were hourly digital climatic maps on temperature, rainfall, relative humidity and leaf wetness (calculated using WeatherProg) feed a phytopathologic mechanistic model simulating the hourly risk of infection by Plasmopara viticola at every location in a pilot area.

02. Education and Qualifications

(2010) Registration in the bulletin board of Torre Annunziata Court **technical consultants** (Naples area, Italy).

(2008) Registration in the **Agronomist Association of Naples** (N°1006 of 07/02/2008).

(2005–2008) **PhD in Applied Pedology**, defending "*Spatial analysis of pedological and environmental features by means of digital soil mapping*" on 30/01/2009.

(2005) **Habilitation** to degree-qualified professional **agronomist**.

(1996–2004) **Master's Degree in Agricultural sciences** on 18/10/2004 at the Università degli Studi di Napoli Federico II defending "*Zonazione olivicola del Cilento: un nuovo approccio*" ("*Cilento olive tree zonation: a new multidisciplinary approach*").

(1997–1998) **Served in the army**: 7th Cremona Regiment of Field Heavy Artillery, Civitavecchia (RM, Italy).

03. Teaching activities

National and foreign universities

(2024– today) Teaching assignment in the Internal Traineeship for the master degree in Precision Livestock Farming (PLF), Dipartimento di Medicina Veterinaria e Produzioni Animali, Università degli Studi di Napoli Federico II. **1 academic credit – 25 hours (integrative didactics) for each academic year**.

(2019– today) Teaching assignment "*Digital Mapping, Geospatial Statistics and Decision Support*" in the master degree in Precision Livestock Farming, Dipartimento di Medicina Veterinaria e Produzioni Animali, Università Federico II di Napoli. **5 academic credits for each academic year**.

(2020– today) Teaching assignment "*Land Evaluation and Soil Geography*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli. **6 academic credits for each academic year**.

(2022– today) Teaching assignment 8 hours lectures in "Spatial statistics and geostatistics for a sustainable agriculture" in the 2nd level Master Degree in *GIS Science and UAV for Integrated Land Management and Natural Resources (LINK)*, Dipartimento di Ingegneria Civile Edile e Ambientale ICEA, Università degli Studi di Padova. **1 academic credit for each academic year**.

(2017–2021) Teaching assignment "*Land Evaluation and Soil Geography*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli. **9 academic credits x 4 academic years**.

(2017–2018) Teaching assignment "*Soils in urban planning and management: advanced geospatial approaches*", Dipartimento di Architettura, Università Federico II di Napoli. **3 academic credits x 1 academic year.**

(2016–2017) Seminar (**2 hours**) "Spatial statistical analysis of soil properties". Teaching "*Land Evaluation and Soil Geography*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli.

(2016–2017) Seminar (**2 hours**) and hands-on (**2 hours**) on *geospatial decision support systems based on soil and land use cover* (e.g. Soil Monitor and SOILCONSWEB). Teaching "*Pedology*" in the Master Degree in Environmental Sciences, Dipartimento di Chimica e Biologia, Università degli Studi di Salerno.

(2016–2017) Seminar (**4 hours**) on "*Spatial distribution of contaminants in soils*". Teaching "*Pedology*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli.

(2015–2016)   Seminar (**2 hours**) and hands-on (**2 hours**) on "*Geospatial decision support systems based on soil and land use cover (e.g. Soil Monitor and SOILCONSWEB)*". Teaching "*Pedology*" in the Master Degree in Environmental Sciences, Dipartimento di Chimica e Biologia, Università degli Studi di Salerno.

(2015–2016)   Seminar (**4 hours**) on "G*eospatial decision support systems based on soil*". *Field and laboratory methods exercise on soil physical and chemical properties*. Teaching "*Pedology*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli.

(2014–2015)   Seminar (**2 hours**) and hands-on (**2 hours**) on "*Pedometrics and digital soil mapping*". Teaching "*Pedology*" in the Master Degree in Environmental Sciences, Dipartimento di Chimica e Biologia, Università degli Studi di Salerno.

(2014–2015)   Seminar (**4 hours**) on "G*eospatial decision support systems based on soil*". *Field and laboratory methods exercise on soil physical and chemical properties*. Teaching "*Pedology*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli.

(2013–2014)   Seminar (**2 hours**) and hands-on (**2 hours**) on "*Pedometrics and digital soil mapping*". Teaching "*Pedology*" in the Master Degree in Environmental Sciences, Dipartimento di Chimica e Biologia, Università degli Studi di Salerno.

(2013–2014)   Seminar (**4 hours**) on "S*patial variability of soil properties*". *Field and laboratory methods exercise on soil physical and chemical properties*. Teaching "*Pedology*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli.

(2012–2013)   Seminar (**4 hours**) on "S*patial variability of soil-plant-atmosphere system and GIS analysis*". *Field and laboratory methods exercise on soil physical and chemical properties*. Teaching "*Pedology*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli.

(2011–2012)   Seminar (**4 hours**) on "*Soil geospatial databases and spatial statistics*". *Field and laboratory methods exercise on soil physical and chemical properties*. Teaching "*Pedology*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli.

(2010–2011)   Seminar (**4 hours**) on "S*patial variability of soil-plant-atmosphere system and GIS implementations and analysis*". *Field and laboratory methods exercise on soil physical and chemical properties*. Teaching "*Pedology*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli.

(2009–2010)   Seminar (**4 hours**) on "S*patial variability of soil properties*". *Field and laboratory methods exercise on soil physical and chemical properties*. Teaching "*Pedology*" in the Master Degree in Environmental and Forestry Sciences, Dipartimento di Agraria, Università Federico II di Napoli.

(2008–2009)   Seminar (**4 hours**) on "*Soil databases and techniques for digital mapping*". Teaching "*Soil threats*" in the Master Degree in Urban planning, Landscape, Territory and Environment, Dipartimento di Architettura, Università di Napoli Federico II.

(2005–2008)   Seminars (**2 hours per academic year**) on (i) *soil physical properties; (ii) soil classification; (iii) spatial variability of the soil-plant-atmosphere system; (iv) GIS implementations and analysis*. Academic years 2005-2006, 2006-2007 and 2007-2008. Teachings in "*Soil Science*", "*Land Evaluation*" and "*Pedology*", Dipartimento di Agraria, Università di Napoli Federico II.

Not in universities

(2016)   Short course (**8 hours**) organized by the LUPT (Urban Planning and Urbanistic Lab) centre in collaboration with Campania Region INU (National Institute of Urban Planning): "*Soil Monitor: a web application to support the accountancy of land take and soil sealing in Italy*". Department of Architecture, Università di Napoli Federico II, **10 May** 2016.

Seminars

(2016)   Seminar (**1 hour**) "*Development of geospatial decision support systems: experiments to support decisions at different scales (from farm scale to land planning)*". Department of Viticulture and Enology, University of California, Davis, 15 luglio 2016.

(2009)   Seminar (**2 hours**) on "*Agrometeorological data retrieval and analysis to aid the spatial prediction of plant phenology*" in the stage on "*Plant Phenology and climate change*", Centro Appenninico C. Jucci, Rieti, 08 July 2009.

Co-advised BSc, MSc and PhD

(2022–2025).   **Tutor and advisor** of Flavia Vittoria Chianese in the Italian National PhD on Artificial Intelligence with a topic on "*HiveTech Space - Analysis and classification of satellite images to measuring melliferous and pollen potential for ecosystem services predicting*", Università degli Studi di Napoli Federico II.

(2022–2025).   **Tutor and advisor** of Roberta Ascolese in the Italian National PhD on Artificial Intelligence with a topic on "*Artificial Intelligence enhancing electronic Traps for Pest monitoring and development of predictive models for agroecosystems sustainable control*", Università degli Studi di Napoli Federico II.

(2017–2018).   **Advisor** of Giovanni Giacco's Master Degree in Computer Engineering with a thesis on "*Deep Learning for Land Cover classification using Multispectral Sentinel-2 Satellite Imagery*", Dipartimento di Ingegneria, Università degli Studi di Napoli Federico II. **Advisor and assistance in data preparation and configuration and training of deep learning models to classify impervious surfaces to aid soil sealing quantification in Italy.**

(2015–2017).   PhD by Solange Scognamiglio in "Scienze Agrarie e Agroalimentari" XXX ciclo, Dipartimento di Agraria, Università degli Studi di Napoli Federico II. **Assistance on the configuration and calibration of models simulating the water and solute transport in soil.**

(2014–2016).   PhD by Simone Valentini in "Valorizzazione e Gestione delle Risorse Agro-Forestali" XXVIII ciclo, "Rapporti tra fertilità forestale, suolo e paesaggio - Il caso studio delle foreste del Camposauro", Dipartimento di Agraria, Università degli Studi di Napoli Federico II. **Assistance on the spatial analysis of the relantionship between soil, forest and lanscape.**

(2010–2012).   PhD by Pierpaolo Moretti in "Valorizzazione e gestione delle risorse agro-forestali" XXV ciclo, "Stabilizzazione della sostanza organica in Andosuoli campani. Il ruolo dei minerali a basso ordine cristallino", Dipartimento di Agraria, Università degli studi di Napoli Federico II. **Assistance on soil database, GIS elaborations and cartographic visualization.**

(2008–2010).   PhD by Antonietta Agrillo in "Valorizzazione e Gestione delle Risorse Agro-Forestali" XXIII ciclo, "Applicazione di metodi geofisici di tipo geoelettrico ed elettromagnetico per lo studio della distribuzione spaziale dei suoli", Dipartimento di Agraria, Università degli Studi di Napoli Federico II. **Assistance on the geospatial analysis including geostatistics at the farm scale combining key pedological properties and soil proximal geophysical**

signals by means of regionalization and coregionalization analysis and kriging and co-kriging predictions.

(2014–2015)   Internship by scholar Davide Campagnaro (Matr: N02000600) in the degree course in Scienze e Tecnologie Agrarie. **Experiments with a tank model on Plasmopara viticola developed in the LIFE+ SOILSONSWEB project**.

04.   Research activity at recognized institutions

(2019-2020)   Visiting Researcher on "*3D Digital Soil Mapping of Soils*" at The University of Sydney under the supervision by and in collaboration with prof. Alex McBratney. From 11-Nov-2019 to 21-Feb-2020. <u>Main objective</u>: advanced digital soil mapping techniques for the 3-D mapping of soil profiles in spatial domain. These data can be used in hydro-pedological models and can be embedded in decision support systems.

(2019)   Visiting Researcher, within the LandSupport H2020 Project, on "*Remote sensing aiding soil sealing quantification*" at the Institute of Geomatics, BOKU University in collaboration with Dr. Francesco Vuolo. From 03-Jul-2019 to 05-Sep-2019.

05.   Postgraduate Education

(2018)   Heuvelink G., de Bruin S. "*Uncertainty Propagation in Spatial and Environmental Modelling*". Wageningen University Campus, Wageningen, **10–14 December** 2018.

(2018)   Badia R. "*PATC Course: Programming Distributed Computing Platforms with COMPSs*". PATC at BSC - CNS (Barcelona), **30 January** 2018.

(2015)   Orlandini S., Tacconi M. "*Introduction to Scientific Programming using GPGPU and CUDA*". CINECA (Rome), **19–20 February** 2015.

(2012)   Aime A., GeoSolutions "*Share and edit geospatial data with GeoServer*". Rome, **24–25** September 2012.

(2011)   AIAM – CRA CMA. "*Agrometeorological data analysis and basic programming* ". Rome, **29 November – 02 Dicember** 2011.

(2010)   Joint Research Centre of the European Commission. "*Sixth Summer School on Sensitivity Analysis of Model Output*". Fiesole (Firenze), **14–17 September** 2010.

(2010)   Costantini V. "*Introduction to eCognition Developer 8*". CNR - ISAFOM, **30 June – 01 July** 2010.

(2010)   AA. VV. "International School of Scientific Computation and MATLAB". Module 3, "*High Performance and Grid Computing with MATLAB*". Università degli Studi di Palermo, **26–30 July** 2010.

(2010)   AA. VV. "International School of Scientific Computation and MATLAB". Module 2, "*Introduction to High Performance and Grid Computing*". Università degli Studi di Palermo, **19–23 July** 2010.

(2010)   Amato U. "*MatLab – Time series analysis*". CNR - ISAFOM, **19 February – 21 June** 2010.

(2009)   CRC, Climate Research Centre. "*Phenology and climate change*". Centro Appenninico C. Jucci, Rieti, **6–8 July** 2009.

(2008)   Basile A. Training period at CNR – ISAFoM on subjects related to hydro-pedology, from **01/01/2008** to **31/12/2008**.

(2007)   Hengl T., Pebesma E., Olaya V. "*Merging GIS and Spatial Statistics*". Università degli Studi di Napoli Federico II, Dipartimento di Agraria, Portici (NA, Italy), **29 January – 03 February** 2007.

(2006)   MacMillan R.A. "*Mapping ecological zones in LandMapR*". Institute for Environment and Sustainability, Joint Research Centre, Ispra (VA, Italy), **19–21 July** 2006.

(2005)   AA. VV. "*Crash course in soil micromorphology and minerology*". Università degli Studi di Napoli Federico II, Dipartimento di Agraria, Portici (NA, Italy), **7–11 November** 2005.

(2005)   AA. VV. "*Soil hydrology (advanced module)*". Università degli Studi di Napoli Federico II, Dipartimento di Agraria, Portici (NA, Italy), **20–23 September** 2005.

(2004)   AA. VV. (2004). "*Soil hydrology (basic module)*". Università degli Studi di Napoli Federico II, Dipartimento di Agraria, Portici (NA, Italy), **23–27 February** 2004.

(2003)   Castrignanò A., Buttafuoco G. "*Geostatistics in soil science*". Università degli Studi di Napoli Federico II, Dipartimento di Agraria, Portici (NA, Italy), **24–28 November** 2003.

06.   Organization, management and coordination of national and international working groups, or involvement in the projects

(From – To)	Description

(2023–2026)   **Soils4Med**. A project funded under the PRIMA initiative, Soils4Med (https://soils4med.eu) aims to develop a harmonized soil health monitoring system tailored for Mediterranean environments, addressing the challenges of soil degradation, sustainable land use, and ecosystem service preservation across the region. The project involves a multidisciplinary consortium of academic and research institutions across Mediterranean countries, working in alignment with the EU Mission "A Soil Deal for Europe." **Main duties and responsibilities**. Task leader for Task 6.2 on operational testing of Decision Support Systems (DSS) for SSWM and soil health planning. Responsibilities include: (i) leading the deployment and user adaptation of the LANDSUPPORT platform's DSS tools in non-EU Mediterranean study areas, (ii) developing custom user interfaces for partners and stakeholders to facilitate data upload, tool operation, and results download, (iii) coordinating with ICARDA, University of Santiago (US), and other partners on implementing use cases to assess tool relevance and effectiveness, and (iv) reviewing the enhanced DSS functionality and quality improvements derived from project-specific spatial data infrastructure (SDI) inputs.

(2022–2025)   **Agritech**. The *National Research Centre For Agricultural Technologies* (AGRITECH) (https://agritechcenter.it), funded by MUR within the PNRR (National Recovery and Resilience Plan). **Spoke n. 2** *Crop Health: a multidisciplinary system approach to reduce the use of agrochemicals*. ***Main duties and responsibilities.*** **Leader of WP2.3** on *Smart technologies towards a sustainable "zero pollution" in agriculture*. Coordination of 11 partners (UNINA, UNIBO, UNICT, e-GEOS, ENG, IBF, UNIPD, UNITO, CREA, CAI, UNIBAS) including universities and big international players to (i) develop accurate environmental monitoring protocols, predictive models for crops, pests and fertilizers management, (ii) promote precision agriculture for a timely and targeted environmental delivery of agrochemicals, (iii) drive the definition of sustainable Integrated Pest Management (IPM) plans and fertilization strategies, (iv) develop a geoSpatial CyberInfrastructure for a Decision Support System (DSS) to reduce the use of agrochemicals and environmental pollution.

(2022–2025)   **FAIR-EASE**. It is a RIA project funded under HORIZON-INFRA-2021-EOSC-01-04, and it involves a consortium of 25 partners from all over Europe (https://fairease.eu). The overall objective is to customize and operate distributed and integrated services for observation and modelling of the Earth system, environment and biodiversity by improving their different components implemented in close cooperation with user-communities, the European Open Science Cloud (EOSC) and research infrastructures in their design and sustainable availability. ***Main duties and responsibilities*. Leader of Pilot 5.1.2** dealing with analysing, visualizing, calculating and assessing land and soil degradation in the Earth Critical Zone (ECZ).

(2022–2025)   **GeoSciences IR**. *Un'Infrastruttura di Ricerca per la Rete Italiana dei Servizi Geologici* (https://geosciences-ir.it), funded by National Recovery and Resilience Plan – PNRR Missione 4, "Istruzione e Ricerca" – Componente 2, "Dalla ricerca all'impresa" – Linea di investimento 3.1, "Fondo per la realizzazione di un sistema integrato di infrastrutture di ricerca e innovazione". GeoSciences IR intends to enhance comparison and exchange with the technical structures that deal with geology at a national and regional level, making available a permanent cloud research infrastructure, also necessary to strengthen the skills useful for monitoring and controlling the territory. ***Main duties and responsibilities*. Leader of UO UNINA06 within Task 5.2B** on *LandSupport Regions*: the task – starting from what has already been produced in the Landsupport Project (see below) – aims to involve regions to build a vast series of use cases of the platform aimed at both a better implementation of territorial policies and to the improvement of the services offered by the LandSupport platform for the needs of the Italian regions.

(2018–2022)   **LANDSUPPORT**. The LANDSUPPORT project (https://www.landsupport.eu), funded by the European Union's Horizon 2020 Framework Program for Research and Innovation (H2020-RUR-2017-2), aims at developing a web-based, open access geoSpatial Decision Support System (SDSS) devoted to reconciling agriculture, environmental sustainability and policy implementation (app.landsupport.eu). Overall, the SDSS will contribute to the development and implementation of land use policies in Europe, and it will promote an integrated and participatory approach towards rural development and environmental policies allowing, among others, evaluation of trade-offs between different land uses. ***Main duties and responsibilities*.** Overall: coordinating (international research groups) of 6 partners (Barcelona Supercomputing Center, BOKU, Rasdaman, Università degli Studi di Milano, CNR, Ariespace, Università Federico II di Napoli) in the development of both the GCI and HPC pipelines including data and modelling chains orchestrated at the level of the middleware. In detail: (i) design of the GCI and of its components and their orchestration; (ii) develop API layers such that to retrieve data as input to models; (iii) develop automatic digital (soil) mapping procedures for different purposes such as pedological, climatic and economic variables; (iv) implementation of the WeatherProg program to automatically manage data measured at agro-meteorological stations (data cleansing, infill gaps, digital climatic maps production); (iv) implementation of the land take and soil sealing toolbox to address high resolution (10/20 meters) accountancy from the local to the European scale; (v) implementation of a model of urban development and relative land covers to evaluate the imprint on ecosystem services in addition to a climate change scenario.

(2017–2019)   **LCIS**. The LCIS (*An advanced low cost system for farm irrigation support*) project is a joint Italian-Israeli R&D projects in the area of "agriculture and food science". "Fifteenth Call for Proposals for Joint R&D Projects – 2017, industrial track". funded by the Ministry of Foreign Affairs and International Cooperation General Directorate for Country Promotion - Italian Republic and Ministry of Science Technology and Space of the State of Israel. ***Main duties and responsibilities*.** Coordination in the design and development of a geospatial DSS (geo-stack WebGIS) to support farmers. In particular: (i) Coordination in the design and development of a middleware for a physically based model to simulate water and

solute transport in the soil-plant-atmosphere system. (ii) Development of a model to simulate LAI over time by assimilation of visible, multispectral and thermic data measured by a drone.

(2016–2019)   <u>**SALTFREE**</u>. Project funded by the Ministry of Agriculture (DM N.28675 on 28/12/2015): contract n° 618127 ERANET – ARIMnet2 "*Coordination of research in mediterranean area*", dal titolo "*Salinization in irrigated areas: risk evaluation and prevention – SALTFREE*". ***Main duties and responsibilities:*** (i) Development and tuning of a physically-based infiltration model (called **multilayer**) to simulate water and solute transport in the soil-plant-atmosphere system; the water module uses a numerical solution at finite elements of the Richards equation while the solute module includes the convection, dispersion, adsorption and decomposition processes. (ii) Development of a model for the inversion of the soil conductivity profiles from proximal electromagnetic induction measurements; the procedure combines the nonlinear model with Tikhonov regularization for ill-posed problems to produce 3-D maps of electrical conductivity on-the-go during field survey.

(2016–2022)   <u>**URCoFi**</u>. The framework agreement URCoFi signed by Campania Region (Italy) and a technical and scientific partnership including the Departiment of Agriculture of the University of Napoli Federico II, the CNR-IPSP (Institute for Sustainable Plant Protection), and different CREA institutes such as PAV (Research Center on Plant Pathology in Rome). **Coordinator of the work package** "Design, develop and maintenance *of a geospatial system of agrometeorological and pedological data to implement pest risk models*". ***Main duties and responsibilities:*** (i) Coordination in the development of the agrometeorological data consulting public dashboard. (ii) Creation of geospatial climatic data cubes. (iii) Coordination and implementation of the development of a low-cost weather station to aid the development of pest risk models for the Campania Region Bulletins. (iv) Fine tuning and calibration of all WeatherProg modules to work in the Campania Region (the main modules are: data decode, quality check, infill, spatial interpolation using a PRISM-like (http://prism.oregonstate.edu) approach written in CUDA-C). (v) Coordination in the development of the agrometeorological network monitor private dashboard (dedicated to Regional agrometeorological technicians). (vi) Coordination and implementation of the development of the pest service consulting private and public dashboard (dedicated to both citizens and Regional technicians).

(2013–2017)   <u>**Soil Monitor**</u>. Project by the CRISP interdepartmental research centre, Università Federico II di Napoli. **Coordination of GeoSolutions srl, programmers (CNR e UNINA), INU e ISPRA in the development of Soil Monitor, a web application for real time soil sealing accountancy at the Country scale** (www.soilmonitor.it). ***Main duties and responsibilities:*** (i) Coordination of the technical working group focused in the implementation of the GCI (Geospatial Cyber-Infrastructure) behind Soil Monitor. (ii) Development of a soil sealing CUDA-C based library enabling GPU computing to support: real time responses, on-the-fly elaborations at very high spatial resolution even across large ROIs, multi-users.

(2015–2016)   <u>**San Giuseppiello (Italy)**</u> – <u>**Application of the protocol LIFE-ECOREMED**</u> (**LIFE11/ENV/IT/275**). Field and research activities to soil survey and spatially interpolation of physical and chemical characteristics of the techno-soils at San Giuseppiello (Giugliano in Campania), within the collaboration agreement between the "Commissariato di Governo ex L. 6/2014 e SS." and CIRAM – Università Federico II di Napoli. ***Main duties and responsibilities:*** (i) Definition of the scheme for soil sampling. (ii) Soil sampling (boreholes, profiles and trenches). (iii) Soil compaction measured by a penetrometer in the field to 60/80 cm in depth. (iv) Geostatistical analysis of the soil properties and of soil contaminants (heavy metals and heavy hydrocarbons). (v) Geostatistical simulations and cumulative distribution functions to calculate maps of the

risk of contamination at given thresholds for critical contaminants (e.g. 350 ppm for Zn and Cr, and 200 ppm for heavy hydrocarbons).

(2015–2016)   <u>**ECOBAT**</u> – <u>**Applicazione del protocollo LIFE-ECOREMED**</u> (**LIFE11/ENV/IT/275**). Research and field activity to soil survey and spatial analysis (dusts, percolation and use capability) in the Project of eco-compatible protocols for agricultural soil remediation in the battery plant ECOBAT by means of the application of the LIFE-ECOREMED approach. Agreement between ECOBAT S.p.a. and CIRAM research center – Università Federico II di Napoli. *<u>**Main duties and responsibilities:**</u>* (i) Soil survey (boreholes and profiles). (ii) Geostatistical analysis of the critical soil properties.

(2013–2015)   <u>**QUARC**</u>. Call for tender CAMPUS for industrial reaserach and experimental development (d.d. 327 on 11.08.2009, POR Campania FESR 2007/2013 implementing the Operative Goals 2.1 and 2.2. Project co-funded by EU and called "Quality of typical crops *in Campania and of its landscape: novel and integrated approaches to enhance the competitivity of the agri-food system – QUARC*". *<u>**Main duties and responsibilities:**</u>* (i) Build of the point climatic database (temperature and precipitation from 1994 to 2015) in Campania Region. (ii) Production of the daily digital climatic maps (min, max and average temperature, and precipitation). (iii) Calculation of the raster maps about the bio-climatic indices for olive groves (No. 4), for chestnut (No. 1), grape (No. 5) and wheat (No. 5). Combination of the bio-climatic indicators to build a land evaluation scheme for the cultivation capability in Campania Region.

(2013)   <u>**FAO**</u>. FAO (Food and Agriculture Organization) has commissioned to the Università degli Studi di Napoli Federico II and CNR (ISAFoM Institute) a study in order to assess the strengths and weaknesses of the FAO models (developed at the Natural Resources and Environment Department) running the global scale evaluation of soils, landscapes and crops. The main scope of the evaluation of FAO models was to optimise the planning about their use in the future. **Overall contribution to the technical, scientific and evaluation of FAO models.** *<u>**Main duties and responsibilities:**</u>* (i) Individual and comparative assessment of GAEZ, LRIMS, BEFS-tools, MOSAICC, AquaCrop and ALES models. (ii) Contribution to the editing of the final report "*Evaluation and assessment of FAO tools for planning of the use and management of natural resources by agriculture at the national, regional and global scales*" delivered to FAO.

(2010–2014)   <u>**SOILCONSWEB**</u>. The SOILCONSWEB LIFE08 ENV/IT/000408 Project "*Multifunctional Soil Conservation and Land Management through the Development of a Web Based Spatial Decision Supporting System*". **Crucial contribution to the definition and development of the dynamic and geospatial component of the decision support system via web**. *<u>**Main duties and responsibilities:**</u>* (i) Development of the software program called **WeatherProg** to automatically manage agro-meteorological data measured at ground weather stations (data check and cleansing, gaps infilling, calculation of digital climatic maps). (ii) Development of the software program called **cvSISE** (Spatial Inference Selector Engine with cross validation) to automatically calculate the digial soil maps of the main soil properties (these maps are used in cascade in other models). (iii) Key contribution to the development of a software program (**multilayer**) to simulate the water and solute transport in the soil-plant-atmosphere continuum. (iv) Development of a bucket model to simulate the risk of infection by the heterotallic oomycete Plasmopara viticola, the causal agent of the grapevine downy mildew. (v) Development of a **middleware** (software component) capable of implementing the expert-based decision when runnung SWAP and multilayer models (such as the addressing of the agricultural best practices). The middleware is integrated in a geospatial cyberinfrastructure implementing a decision support system.

(2010–2013) **ZOVISA.** The "*ZOnazione VIticola a Scala Aziendale*" (ZOVISA) project was co-funded by the European Agricultural Fund for Rural Development (EAFRD, 2007–2013), Measure 124 of the Regional Rural Development implemented by the Campania Region. The Department of Agriculture (UNINA) in collaboration with the CNR (ISAFoM Institute) implemented a procedure for the farm scale zoning at Quintodecimo (Mirabella Eclano – AV) and Agricola Del Monte (Ponte – BN) farms. ***Main duties and responsibilities:*** (i) Pedological and hydraulic survey. (ii) GIS and geostatistical analysis. (iii) Production of the map of grapevine zoning.

(2008–2010) **ARMOSA – IDRO II**. The project "*Monitoring of nitrogen loss from agricultural soils to surficial waters, acquifers and atmosphere*" in collaboration with ERSAF (Lombardia Region) "*Development of a methodology to quantify nitrate vulnerability from agriculture in two areas in Campania Region*" on the topic **"Digital Soil Mapping procedures to study the spatial variability of soils and soil properties"**.

(2008–2010) **MIUR–PRIN SANGONE**. PRIN Project to study the relationships between hydrological processes and physical and climatic characteristics of the landscape at the regional and catchment (Sangone) scale: "*Analysis of soil properties and hydro-pedological processes at different spatial scales*". ***Main duties and responsibilities:*** (i) geospatial analysis by means of geostatistical variography and mapping. (ii) Production of auxiliary covariates by means of the Digital Terrain Analysis. (iii) Fuzzy segmentation of the landforms in Sangone catchment to aid the spatial characterization of the soil classes and to recognize the spatial locations in which perform the hydrologic and pedological survey.

(2008) **CIVSA**. The "*Center for the Interpretation and eValuation of Agricultural Soils (CIVSA)*" was funded by the Campania Region in order to continue the activities of the previous project "Soils of Campania Region – Activation of the CIVSA Center to evaluate agricultural soils". ***Main duties and responsibilities:*** (i) geospatial statistical analysis of different heavy metals; (ii) production of maps of contaminants above critical thresholds; (iii) further development of the software EDASS (Exploratory Data Analysis with Stratification and (geo-)Statistics) to build serialized reports on different contaminants and thresholds (I started developing EDASS during my PhD).

(2005–2007) **MIUR–PRIN MAPPE**. PRIN Project "Advanced *Methodologies in Pedology and Pedometry (MAPPE): studying the sustainability of agricultural, forestry and pasture systems in Italy*". ***Main duties and responsibilities:*** (i) disturbed and undisturbed soil survey with full soil profile field descriptions; (ii) geostatistical study to analyse the spatial variability of required pedological attributes; (iii) use of artificial intelligence (neural nets, genetic algorithms) for data mining and for the spatial interpolation of pedological and hydraulic attributes pertaining the soil-plant-atmosphere system.

(2003–2007) **Nitrates Campania**. Participation to the project "*Development of a methodology to quantify nitrate vulnerability from agriculture in two areas in Campania Region*". ***Main duties and responsibilities:*** multivariate geostatistical analysis of specific soil hydrological (e.g. soil water content) and pedological (e.g. soil texture) properties to characterize the spatial variability of soils and the production of thematic digital soil maps.

(2003–2005) **GNDCI**. Collaboration in the research duty within the CNR G.N.D.C.I. – Presidenza del Consiglio dei Ministri on *pedological studies* related to hydro-geologic disasters.

(2003–2005) **MIUR–PRIN**. Participation to the PRIN project "Novel methods to study the spatial variability of soils". ***Main duties and responsibilities:*** (i) disturbed and undisturbed soil survey with full soil profile field descriptions; (ii) geostatistical study to analyse the spatial variability of required pedological attributes.

07. Convener at national and international conferences

(2024)   **Langella G.**, Lo Papa G., Montanarella L., Schillaci C. (2024). <u>Session</u>: *Digital Soil Mapping, Decision Support Tools and Soil Monitoring Systems in the EU*, in **Centennial Celebration and Congress of the International Union of Soil Sciences**, Florence (Italy), 19–21 May 2024.

(2019)   **Langella G.**, Baumann P., Vuolo F. (2019). <u>Short Course</u>: *Implementation of software components to build web-based decision support systems: the case of the land take pipeline within a geospatial cyberinfrastructure*. EGU General Assembly, Vienna (Austria), 7–12 April 2018, Mon, 08 Apr, 14:00–15:45, SC1.7/ESSI1.20/HS12.12/SSS13.41.

(2019)   Xu X., **Langella G.**, Lei T., Lucas-Borja M.E., Tarolli P., de Sousa L.M., (2019). <u>Disciplinary Session</u>: *New technologies in soil conservation and eco-sustainability: supporting decision making*. EGU General Assembly, Vienna (Austria), 7–12 April 2018, Wed, 10 Apr, 08:30–12:30, SSS12.5/ESSI*/GI3.15/HS3.8/NH9.26/NP9.2.

(2018)   Jackisch C., **Langella G.** (2018). <u>Disciplinary Session</u>: *Quantitative Approaches to Complex Soil Systems*. EGU General Assembly, Vienna (Austria), 8–13 April 2018, Mon, 09 Apr, 08:30–12:00, SSS11.4.

08. Participation to national and international conferences

Oral presentations

(2025)   **Langella G.**, Manna P., Mileti F.A. (2025). Datacubes as enablers for land take quantification in LandSupport Regions. EGU General Assembly 2025, Session ESSI3.1, Vienna (Austria), 30 April 2025.

(2023)   **Langella G.**, Bancheri M., Manna P., Mileti A.F., Ferraro G., Minieri L., Basile A., Terribile F. (2024). *The LandSupport Platform to Help Land Managers in the Mitigation of Degradation of Natural Resources*. IEEE International Workshop On Metrology for Agriculture and Forestry, Pisa (Italy), 06–08 November 2023.

(2022)   **Langella G.** (2022). <u>Invited talk</u>: *Approcci digitali avanzati a supporto della governance del suolo (Advanced digital approaches to support soil governance)*. 43th SISS Workshop, Roma (Italy), 05–07 October 2022.

(2022)   **Langella G.** (2022). <u>Invited talk</u>: *Geospatial decision support systems embedding digital soil mapping engines*. 22nd World Congress of Soil Science, Glasgow (UK), 31 July–05 August 2022.

(2018)   Martino R., Nicolazzo M., **Langella G.** (2018). *A full integrated system for agroclimatic and pest monitoring at farm and landscape scales in Campania Region*. 1st Workshop on Metrology for Agriculture and Forestry, Ancona (Italy), 01–02 October 2018.

(2017)   **Langella G.**, Basile A., Giannecchini S., Moccia F.D., Munafò M., Terribile F. (2017). *Soil Monitor: an advanced and freely accessible platform to challenge soil sealing in Italy*. In: Vol. 19, EGU2017-8418, EGU General Assembly, Vienna (Austria), 23–28 April 2017.

(2016)   **Langella G.**, Manna P., Basile A., Terribile F. (2016). *Development of geospatial decision support systems: CRISP experiments to aid urban planning.* In: AMFM Conference, Università degli Studi di Salerno, Fisciano (SA, Italy), 9 June 2016.

(2015)   **Langella G.**, Basile A., Giannecchini S., Iamarino M., Munafò M., Terribile F. (2015). *Development of a novel tool to account soil sealing and land take at antional scale.* In:

Intalian conference "Recuperiamo Terreno. Politiche, azioni e misure per un uso sostenibile del suolo", Frigoriferi Milanesi, Via G.B. Piranesi 10, Milano (Italy), 6 May 2015.

(2015)   **Langella G.**, Basile A., Giannecchini S., Iamarino M., Munafò M., Terribile F. (2015). *Development of a web application for the national scale lant take accountancy.* 40° Congresso Nazionale SISS "Suoli di Qualità per una Vita di Qualità", Rome, 1–3 December 2015.

(2014)   **Langella G.**, Munafò M., Giannecchini S., Nicolazzo M., Terribile F. (2014). *Advanced tools for the accountancy of soil land take at the national scale.* In: Convegno SIPe "Le nuove frontiere per la protezione e la gestione sostenibile del suolo e del paesaggio", Reggia di Portici (NA, Italy), 21–24 September 2014.

(2014)   **Langella G.** (2014). *WeatherProg: a computer program for the automatic handling of climatic data.* In proceedings of the XVII AIAM workshop on the "Role of agrometeorology in the new politics in agriculture", Rome, 10–12 June 2014.

(2013)   **Langella G.**, Basile A., Bonfante A., Manna P. (2013). *Automaticity and computation time in digital mapping: some experiments in regression kriging and neurocomputing.* In: Convegno Nazionale della Società Italiana di Scienza del Suolo, "La Centralità del Suolo nel Sistema Agrario e Forestale", Viterbo, 25–28 June 2013.

(2013)   **Langella G.**, Basile A., Bonfante A., Manna P., Terribile F. (2013). *Bootstrapped neural nets versus regression kriging in the digital mapping of pedological attributes: the automatic and time-consuming perspectives.* In: Vol. 15, EGU2013-4461, EGU General Assembly, Vienna (Austria), 07–12 April 2013.

(2012)   **Langella G.**, Basile A., Bonfante A., Manna P., Terribile F. (2012). *The SOILCONSWEB Project: how to integrate the spatial component of a Web Based Spatial Decision Support System.* In: ECSSS 4° International Congress EUROSOIL 2012 "Soil Science for the Benefit of Mankind and Environment", Fiera del Levante, Bari (Italy), 2–6 July 2012.

(2012)   **Langella G.**, Basile A., Bonfante A., Manna P., Terribile F. (2012). *The LIFE+ SOILCONSWEB project: a web based spatial decision support system embedding DSM engines.* In: 5th Global Workshop on Digital Soil Mapping "*Digital Soil Assessments and Beyond …*", University of Sydney, Sydney, 10–13 April 2012.

(2009)   **Langella G.** (2009). *Neurocomputing in the spatial interpolation of precipitation in Campania Region at high spatiotemporal resolution (20 m by 10 g).* In: IX Convegno Nazionale AIIA su "Ricerca e innovazione nell'ingegneria dei biosistemi agro-territoriali", Hotel Continental Terme, Ischia Porto (NA, Italy), 12–16 September 2009.

(2009)   **Langella G.**, Minieri L., Terribile F. (2009). *Clay content analysis across landscape by means of linear and non-linear empirical models.* In: Vol. 11, EGU2009-7233-1, EGU General Assembly, Vienna (Austria), 19–24 April 2009.

(2007)   Hengl T., **Langella G.** (2007). *Mapping Soil Colour from Munsell Colour Chart Codes.* In: Book of Abstracts. Pedometrics 2007, Tubingen (Germany), 27–30 August 2007, p. 11.

Invited lectures for policy-makers

(2022)   Terribile F., **Langella G.** (2022). La ricerca a supporto della legge quadro e la piattaforma digitale "Landsupport Horizon 2020", Senate of the Italian Republic, Room Sala Capitolare, Piazza della Minerva 38, Rome (Italy), 19 July 2022.

(2019)   Terribile F., **Langella G.** (2019). Press Conference of the Landsupport Horizon 2020 – *An Operational Tool To Challenge Land Take At The European Scale.* Sofitel Brussel Europe, Bruxelles, 03 July 2019.

(2016)   **Langella G.** (2016). Soil Monitor in action: tutorial on using the web platform. In: *"Presentation of SOIL MONITOR. An innovative research tool for the accountability of land take and soil sealing at the Italian scale…"*, Senate of the Italian Republic, Room Caduti di Nassirya, Piazza Madama 11, Rome (Italy), 28 June 2016.

(2014)   **Langella G.** (2014). *The upscaling challenge: soil sealing at the country scale (Italy).* In: A new frontier in landscape management: real time assessing of land trade-offs (and more), Avenue de Beaulieu 5, BU-5, Room 0/B, DG ENV, Bruxelles, Wednesday 26 February 2014.

(2012)   **Langella G.**, (2012). *Tools for the digital mapping of environmental parameters (climate, soil) in the SOILCONSWEB Project.* JRC, Ispra (Italy), 10 December 2012.

Oral presentations by other authors

(2025)   Perreca C., **Langella G.**, Terribile F. (2025). AI-based approaches can improve soil structure evaluation in micromorphological analyses. EGU General Assembly 2025, Session SSS6.2, Vienna (Austria), 28 April 2025.

(2018)   Terribile F., **Langella G.**, … (2018). *New frontiers in soil conservation and landscape management: Geospatial Cyberinfrastructure applied to Decision Support System.* In: 21st World Congress in Soil Science (WCSS), Rio, Brazil, 12–17 August 2018.

(2018)   Adamo P., Caporale A.G., Vingiani S., Agrelli D., Langella G., Terribile F. (2018). *A multi-scale approach for soil contamination assessment.* In: 21st World Congress in Soil Science (WCSS), Rio, Brazil, 12–17 August 2018.

(2017)   Petrella V., Iesu L., Saccone G., **Langella G.**, Caputo B., Della Torre A., Salvemini M. (2017). *The Procida island (ITALY, Campania region): an optimal site for the field testing of mosquito IPM control methods.* In: Third FAO–IAEA International Conference on Area-wide Management of Insect Pests: Integrating the Sterile Insect and Related Nuclear and other Techniques, Vienna, Austria, 22–26 May 2017.

(2017)   Manna P., Basile A., Bonfante A., D'Antonio A., De Michele C., Iamarino M., **Langella G.**, Mileti A.F., Pileri P., Vingiani S., Terribile F. (2017). *A geospatial soil-based DSS to reconcile landscape management and land protection.* In: Vol. 19, EGU2017-8570, EGU General Assembly, Vienna (Austria), 23–28 April 2017.

(2017)   Bonfante A., Impagliazzo A., Fiorentino N., **Langella G.**, Mori M., Fagnano M. (2017). *The support of local farming communities and crop production resilience to climate change through the cultivation of giant reed (Arundo donax sp.). An Italian case study.* In: Vol. 19, EGU2017-4772, EGU General Assembly, Vienna (Austria), 23–28 April 2017.

(2016)   Bonfante A., Alfieri S.M., Albrizio R., Basile A., De Mascellis R., Gambuti A., Giorio P., **Langella G.**, Manna P., Monaco E., Erbaggio A., Moio L., Terribile F. (2016). *Effects of future climate change on grape quality: a case study for the aglianico grape in Campania Region, Italy.* In: 11th International Terroir Congress, Linfield College, Willamette Valley, Oregon, 10–14 July 2016.

(2016)   Coppola E., Grimaldi M., **Langella G.**, Moccia F.D., Terribile F. (2016). *Soil sealing accountancy in a key metropolitan area: experiments in Naples using the Soil Monitor web application.* In: European Ecosystem Services Conference, Belgium, 19–23 September 2016.

(2016)   Bonfante A., Gambuti A., Monaco E., **Langella G.**, Manna P., Orefice N., Albrizio R., Basile A., Terribile F. (2016). *Effects of future climate change on grape and wine quality: a case study for the Aglianico grape, Campania.* Italy. In: Vol. 18, EGU2016-15203, EGU General Assembly, Vienna (Austria), 17–22 April 2016.

(2016)   Scognamiglio S., Calcaterra D., Iamarino M., **Langella G.**, Orefice N., Vingiani S., Terribile F. (2016). *Andic soil features and debris flows in Italy. New perspective towards prediction.* In: Vol. 18, EGU2016-10543, EGU General Assembly, Vienna (Austria), 17–22 April 2016.

(2015)   Basile A., Bonfante A., **Langella G.**, Minieri L., De Michele C., D'Antonio A., Manna P., Terribile F. (2015). *Soil consumption: An innovative system for better planning and managing soil in urban planning context.* In: Vol. 17, EGU2015-13101, EGU General Assembly, Vienna (Austria), 12–17 April 2015.

(2014)   Manna P., Bonfante A., Basile A., **Langella G.**, Agrillo A., De Mascellis R., Mileti A.F., Minieri L., Orefice N., Terribile F. (2014). *A web-based spatial decision supporting system (S-DSS) for grapevine quality: the viticultural tool of the SOILCONS-WEB Project.* In: Vol. 16, EGU2014-14903, EGU General Assembly, Vienna (Austria), 27 April – 02 May 2014.

(2013)   Terribile F., Saracino A., Basile A., Amedeo A., Demichele C., Bonfante A., D'Urso G., **Langella G.**, Manna P., Marotta L., Mazzaccara M., Minieri L. (2013). *Development of integrated web-based decision support systems (W-SDSS) for the sustainable management of forest and agriculture landscapes.* In: Abstract-Book Comunicazioni Orali - IX Congresso SISEF, Bolzano, 16–19 September 2013.

(2010)   Terribile F., Iamarino M., Agrillo A., Basile A., De Mascellis R., **Langella G.**, Mele G., Mileti F.A., Minieri L., Moretti P., Vingiani S. (2010). *Andic soils and catastrophic mudflows in Italy: Morphological and hydropedological evidences.* In: 19th World Congress in Soil Science, Brisbane, Australia, 1–4 August 2010.

(2010)   Bonfante A., Basile A., De Lorenzi F., **Langella G.**, Terribile F., Menenti M. (2010). *The adaptative capacity of a viticultural area (Valle Telesina, Southern Italy) to climate changes.* In: Proceedings VIII International Terroir Congress, Soave (VR) Italy, 14–18 June 2010, 96–101 pp.

(2008)   Manna P., Basile A., Bonfante A., Carnicelli S., De Mascellis R., **Langella G.**, Terribile F. (2008). *Field scale variability of measured and estimated hydraulic properties: stochastic analysis of hydraulic behaviour sensitivity and investigation on spatial structures of the data.* In: EUROSOIL su "Soil, Society and Environment", Vienna, Austria, 25–29 August 2008.

(2007)   Manna P., Basile A., Bonfante A., Carnicelli S., De Mascellis R., **Langella G.**, Terribile F. (2007). *Spatial variability of hydraulic properties of Lodi plain soils: sensitivity analysis and prediction analysis.* In: SISS su "La Scienza del Suolo nei territori Montani e Collinari", Milano-Chiavenna (Italy), 9–13 July 2007.

(2005)   Bonfante A., Basile A., Manna P., **Langella G.**, Terribile F. (2005). *A new approach to viticulture zoning by means of hydrological modelling and GIS procedure.* In: Book of Abstracts. ISHS International Workshop on Advances in Grapevine and Wine Research, Venosa (PZ, Italy), 15–17 September 2005, p. 205.

Poster presentations

(2025)   Mauriello I.E., **Langella G.**, Terribile F., Miralto M. (2025). Customizing Trends.Earth for land degradation assessment in the earth critical zone: a FAIR-EASE approach. EGU General Assembly 2025, Virtual Poster Session VPS20, 02 May 2025.

(2017)   **Langella G.**, Manna P., Mileti A.F., Munafò M., Coppola E., Grimaldi M., Basile A., Terribile F. (2017). *Soil Monitor: a web platform to face the soil sealing problem.* In: XIV Convegno AISSA, Università degli studi del Molise, Campobasso (Italy), 16–17 February 2017.

(2016)   **Langella G.**, Basile A., Bonfante A., Manna P., Terribile F. (2016). *Evaluation of the dynamic behaviour of terroir, in terms of expected grape quality, using a web-based decision*

support system: the case study of Aglianico grapevine in Valle Telesina (Italy). In: 11th International Terroir Congress, Linfield College, Willamette Valley, Oregon, 10–14 July 2016.

(2016)   **Langella G.**, Basile A., Bonfante A., De Mascellis R., Manna P., Terribile F. (2016). *Semi-automatic handling of meteorological ground measurements using WeatherProg: prospects and practical implications.* In: Vol. 18, EGU2016-13982, EGU General Assembly, Vienna (Austria), 17–22 April 2016.

(2016)   **Langella G.**, Basile A., Giannecchini S., Iamarino M., Munafò M., Terribile F. (2016). *Soil Monitor: an open source web application for real-time soil sealing monitoring and assessment.* In: Vol. 18, EGU2016-13602, EGU General Assembly, Vienna (Austria), 17–22 April 2016.

(2016)   **Langella G.**, Basile A., Coppola A., Manna P., Orefice N., Terribile F. (2016). *Development and deployment of a water-crop-nutrient simulation model embedded in a web application.* In: Vol. 18, EGU2016-13338, EGU General Assembly, Vienna (Austria), 17–22 April 2016.

(2015)   **Langella G.**, Basile A., Coppola A. (2015). *A novel model to simulate the water and solute infiltration in soils and its integration in a web based decision support system.* 40° Congresso Nazionale SISS "Suoli di Qualità per una Vita di Qualità", Roma, 1–3 December 2015.

(2009)   **Langella G.**, Terribile F., Basile A. (2009). *Neurocomputing and raingauge network measurements: low cost spatiotemporal analysis of 10-days singletons to attempt high resolution inference.* In: Vol. 11, EGU2009-11149, EGU General Assembly, Vienna (Austria), 19–24 April 2009.

(2007)   **Langella G.** (2007). *An artificial neuronal system to the analysis of rainfall in the spatil-temporal domain.* In: SISS su "La Scienza del Suolo nei territori Montani e Collinari", Milano-Chiavenna (Italia), 9–12 July 2007.

Poster presentations by other authors

(2017)   Vingiani S., Caporale A.G., Agrelli D., **Langella G.**, Terribile F., Adamo P. (2017), "*Monitoring heavy metal content in polluted sites by portable XRF analyser and conventional laboratory-based techniques: relations and differences according to elements properties and origin*", 14th International Conference on the Biogeochemistry of Trace Elements, 16–20 July 2017, Zurich, Switzerland.

(2013)   Teobaldelli M., Cona F., Saracino A., Migliozzi A., D'Urso G., Manna P., **Langella G.** (2013). Stima della provvigione e della biomassa forestale in Valle Telesina (BN) mediante utilizzo di dati LiDAR e rilievi dendrometrici a terra. In: Abstract-Book Posters - IX Congresso SISEF, Bolzano, 16–19 September 2013.

(2013)   Quattrocchi M., Teobaldelli M., Saracino A., Cona F., Manna P., **Langella G.** (2013). Utilizzazione di dati inventariali a scala aziendale e dati LiDAR per la stima delle variazioni temporali dello stock di carbonio epigeo nel demanio forestale di Vitulano (BN, Campania). In: Abstract-Book Posters - IX Congresso SISEF, Bolzano, 16–19 September 2013.

(2013)   Bonfante A., Basile A., Menenti M., Monaco E., Alfieri S.M., Manna P., **Langella G.**, De Lorenzi F. (2013). The use of a hydrological physically based model to evaluate the vine adaptability to future climate: the case study of a Protected Designation of Origin area (DOC and DOCG) of Southern Italy. In: Vol. 15, EGU2013-10514, EGU General Assembly, Vienna (Austria), 07–12 April 2013.

(2012) F. Terribile, A. Basile, A. D'Antonio, C. De Michele, A. Bonfante, M. Colandrea, R. De Mascellis, G. D'Urso, M. Iamarino, G. Langella, P. Manna, L. Marotta, and L. Minieri (2012). Multifunctional soil conservation and land management through the development of a web based spatial decision supporting system. In: Vol. 14, EGU2012-11111, EGU General Assembly, Vienna (Austria), 22–27 April 2012.

(2008) Manna P., Basile A., Bonfante A., De Mascellis R., **Langella G.**, Terribile F. (2008). *Stochastic analysis of field-scale hydraulic behaviour sensitivity to measured and estimated hydraulic properties.* In: Vol. 10, EGU2008-A-05159, EGU General Assembly, Vienna (Austria), 13–18 April 2008.

(2006) De Marco E., D'urso G., **Langella G.**, Savarese M., Parisini C., Sacchi R. (2006). *A methodology proposal for olive zoning. A case study in the Cilento Area.* In: OLIVEBIOTEC 2006. Second International Seminar on "Biotechnology and quality of olive tree products around the Mediterranean basin", Marsala-Mazara del Vallo (Italia), 5–10 November 2006, p. 423-426.

09. Awards, prizes and honours

(2017) **Best poster**: Vingiani S., Caporale A.G., Agrelli D., **Langella G.**, Terribile F., Adamo P. (2017), "*Monitoring heavy metal content in polluted sites by portable XRF analyser and conventional laboratory-based techniques: relations and differences according to elements properties and origin*", 14th International Conference on the Biogeochemistry of Trace Elements, 16-20 July 2017, Zurich, Switzerland. Best Poster Prize granted by Division VI – Chemistry and the Environment of the International Union of Pure and Applied Chemistry (IUPAC) and awarded during the Special Symposium Trace elements analysis of environmental samples with X-rays of the ICOBTE2017 conference.

(2017) **Best poster**: **Langella G.**, Manna P., Mileti A.F., Munafò M., Coppola E., Grimaldi M., Basile A., Terribile F. (2017), "*Soil Monitor: a web platform to face the land take problem*", XIV AISSA Conference, Università degli Studi del Molise, Campobasso, 16-17 February 2017.

10. Publications (*corresponding author)

Scientific papers with I.F.

(2025) Terribile, F., Bonifacio, E., Corti, G., Ferraro, G., **Langella, G.**, Mileti, F. A., et al. (2025). A smart soil framework law proposal from Italy: Bridging the gap between policy and implementation. Soil Security, 19, 100190. https://doi.org/10.1016/j.soisec.2025.100190.

(2024) Terribile, F., Iamarino, M., **Langella, G.**, Mele, G., Gargiulo, L., Mileti, F. A., et al. (2024). Integrated, multiscale forensic soil science applied to an unsolved murder case in Italy. European Journal of Soil Science, 75(6), e70019. https://doi.org/10.1111/ejss.70019.

(2024) Bancheri, M., Basile, A., Terribile, F., Langella, G., Botta, M., Lezzi, D., Cavaliere, F., Colandrea, M., Marotta, L., De Mascellis, R., Manna, P., Agrillo, A., Mileti, F. A., Acutis, M., & Perego, A. (2024). A web-based operational tool for the identification of best practices in European agricultural systems. Land Degradation & Development, 35(13), 3965–3980. https://doi.org/10.1002/ldr.5114.

(2024) Lo Papa G, Schillaci C, Fantappiè M, Langella G. Editorial of the Special Issue Digital Soil Mapping, Decision Support Tools and Soil Monitoring Systems in the Mediterranean. *Land*. 2024; 13(6):815. https://doi.org/10.3390/land13060815.

(2024)   Mileti, F. A., Russo, D., Fraissinet, M., Langella, G., Ferraro, G., & Terribile, F. (2024). Supporting the planning and management of biodiversity through the development of a geospatial decision support system. Land Degradation & Development, 35(5), 1837–1849. https://doi.org/10.1002/ldr.5024.

(2024)   Terribile, F., …, Langella G, …, Basile, A., The LANDSUPPORT geospatial decision support system (S-DSS) vision: Operational tools to implement sustainability policies in land planning and management. *Land Degradation & Development*, 2024, 35(2), 813–834. https://doi.org/10.1002/ldr.4954.

(2024)   Manna P, Agrillo A, Bancheri M, Di Leginio M, Ferraro G, Langella G, Mileti FA, Riitano N, Munafò M., A Geospatial Decision Support System for Supporting the Assessment of Land Degradation in Europe. *Land*. 2024; 13(1):89. https://doi.org/10.3390/land13010089.

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(2014)   **Langella G.** (2014). *WeatherProg: a computer program for the automatic handling of climatic data.* In XVII workshop on the "Role of agrometeorology in the new agricultural policies", Rome, 10-12 June 2014, ISBN: 978-88-555-3271-6.

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(2021)   Petrella V., G. Saccone, **G. Langella**, B. Caputo, M. Manica, F. Filipponi, A. Della Torre and M. Salvemini. *Citizen Science and Asian Tiger Mosquito: A Pilot Study on Procida Island, a Possible Mediterranean Site for Mosquito, Integrated Vector Management Trials*, In: Hendrichs J., Pereira R. and Vreysen M.J.B., (Eds.), *Area-Wide Integrated Pest Management: Development and Field Application*, CRC Press, Boca Raton, FLORIDA, USA.

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(2013)   Terribile F., Basile A., Bonfante A., Carbone A., Colombo C., **Langella G.**, Iamarino M., Manna P., Minieri L., Vingiani S. (2013). "*Future Soil Issues*", p. 303-348. In: Costantini E.A. & Dazzi C. (Eds), "*The soils of Italy*", pp. 354, World Soils Book Series, Springer.

11. Reviewer, international journals

Journal (No. of papers)

(2013)   Vadose Zone Journal (1), Journal of Hydrology (1),

(2012)   Soil Science Society of America Journal (1), Journal of Hydrology (2), Hydrological Sciences Journal (1), Ecological Modelling (2)

(2011)   Ecological Modelling (1)

(2010)   Natural Hazards (1), Hydrology and Earth System Sciences (1), Ecological Modelling (3)

12. Main fields of research and activities (from the latest)

Soil informatics and geospatial data science for pedological applications: integration of pedology with informatics, data science and geospatial analysis to develop digital soil databases, decision support systems, and interoperable tools for data-driven soil governance and environmental monitoring.

Development and application of high-performance Web Processing Services (WPS) for dynamic geospatial analysis: design and implementation of advanced geospatial services (WPS) based on CUDA and multi-GPU technologies, integrated into cyberinfrastructures for territorial decision support (e.g., Soil Monitor), enabling real-time processing at national scale.

Digital Soil Mapping of soil profiles. It is a work of 3D digital mapping of soil profiles which I started during my PhD using artificial neural networks. Then, I extended the work in a paper of mine Langella *et al.* (2016). I performed a further logic and implementation development of this approach by means of machine learning methods during the collaboration as *visiting researcher at The University of* Sydney. It is a work in progress which will allow one to transform point based observations about soil profiles in 3D continuous geospatial representations of soils in digital format feeding precision pedometric approaches even at wide geospatial domains.

Spatial Simulated Annealing (SSA) algorithm. A constrained version of the SSA algorithm is being used to investigate the problem of soil sampling optimization for contamination characterization also in consideration of the current legislation.

Imperviousness/LULC automatic classification. Training an ANN to predict multi-temporal imperviousness/LULC classes by means of multi-band spatial-temporal satellite imagery.

Model of geophysical inversion. Development of an inversion model of the apparent soil electrical conductivity measured by proximal soil sensing. It is based on Tikhonov regularization to solve ill-conditioned problems and can produce 3-D electrical conductivities fields in case of repetitive sampling (e.g. soil transects).

NDVI. Remote sensing phenology deriving metrics from the NDVI signal from TERRA and AQUA satellites of the MODIS constellation using an automatic procedure. The first step deals with the extraction of a temporal NDVI series from the stack of multi-temporal grids (slicing the data cube) at a specific geospatial point location. This raw time series is filtered by harmonic regression describing the yearly trend and the seasonal patterns. The filtered signal is processed to derive NDVI-based phenological metrics such as the greenness, senescence, amplitude and time-integrated NDVI. The phenological metrics have unveiled an interesting potential in the contribution to spatial prediction models in particular of key soil properties.

multilayer. Collaboration in the development of a software program, called multilayer, to the physically based simulation of the water and solute transport in the soil-plant-atmosphere system. Multilayer was

embedded in a geospatial DSS for resources use optimization by means of a dedicated middleware which can simplify the input information by end users.

Soil Monitor (www.soilmonitor.it). (i) Coordination in the development of a demo geospatial web application to support decisions (SDSS) at the country scale, based on open-source technologies that can solve user requests in real time. Soil Monitor allows the accountancy and the monitoring of land take and soil sealing by means of a high-performance computing GCI (geospatial cyber-infrastructure) based on a GIS server that exposes OGC-compliant services such as WPS (Web Processing Service). (ii) Development of CUDA-C codes to enable GPUPU calculations embedded in WPS. A WPS has a three-layered shell in which JAI wraps JCUDA which in turn wraps CUDA-C. The CUDA technology has the major advantage that a 100x to 500x acceleration is gained and that geospatial calculations are performed on-the-fly to enable real-time responses over the SDSS web application.

LULCC (www.soilmonitor.it). Development of a WPS (Web Processing Service), included in the Soil Monitor GCI, to calculate matrices of land use and land cover changes at 100m spatial resolution. The most external WPS-LULCC shell is written in CUDA-C and is fully compatible with multi-GPU environments.

PlasmoGrid. Development and deployment of a demo web app, called PlasmoGrid (http://weatherprog4u.com), which embeds a model for the hourly spatiotemporal simulation of the risk of infection by P. viticola. PlasmoGrid uses in input agrometeorological data cubes produced by the WeatherProg software and runs the P. viticola mechanistic model developed by Rossi *et al.* (2008) "A mechanistic model simulating primary infections of downy mildew in grapevine". PlasmoGrid outputs aid the public territorial authorities in charge of preparing phytopathologic bulletins, indeed the demo can work at both a specific location and a set of grid locations.

BAGAP. Development of a geospatial predictive nonlinear model based on mixed technologies including artificial neural networks aggregated in ensembles by means of machine learning, genetic algorithms sensitivity analysis (on the parameter of both the neural and the genetic components of the mixed model). BAGAP was successfully used to perform spatial interpolation and showed better performance (i.e. minor error) in contrast with other classes of models commonly used in literature to interpolate soil properties in spatial domain (such as the multi-collocated co-kriging and the iterative regression kriging). Interesting examples are the spatiotemporal interpolation of (1) rainfall in Campania Region (2-D + 1-T domain), clay content in the soils of Valle Telesina (3-D domain), and (3) the spatial distribution of andic properties in the Italian mountainous ecosystems (3-D domain). The last application is ready for publication while the first two were already published in journals with IF.

WeatherProg. Development of a software program called WeatherProg to automatically manage agrometeorological data. The first implementation was carried out accoridng to the requirements of the SOILCONS-WEB (LIFE08 ENV/IT/000408) Project but the program was progressively modified and updated in order to be accommodate the requirements of both the URCoFi Agreement and the innovative startup GeoProc Service s.r.l.
Temperature, rainfall, relative humidity, solar radiation, atmospheric pressure and wind speed are the agrometeorological variables commonly handled by the program using different temporal scales aggregating the most fundamental units of measurements (i.e. the 10-minute measurements are commonly aggregated to build hourly and daily data). WeatherProg performs the following operations:
- (i). The real-time report with measurements from all sensors and stations belonging to a monitoring network arrives to WeatherProg via a (S)FTP transfer. [data retrieval]
- (ii). The report is decoded according to time scale and sensors and data is sotred in PostgreSQL. [data decoding]
- (iii). Quality check of time series to automatically recognize good measurements from wrong and missing ones which are flagged as unavailable for subsequent infilling. An anomalous datum is recognized thanks to different kinds of and interlinked quality checks such as logical, climatologic,

spatial, temporal and persistency checks. Certification of abnormality is semi-automatic and is the result of the combination of the data-driven WeatherProg checking procedure and the knowledge-based human checking in order to finally assign the definitive flag (such as GOOD, WRONG and so on).

(iv). Anomalies and missing data are all flagged to be interpolated by means of an automatic linear regression procedure. Different methods of interpolations are available such as a deterministic method (based on moving average with growing kernel) or a statistical method (a stepwise multilinear regression using other stations after an optimization step). [data infilling]

(v). Spatial interpolation of point data considering the scale of the application that is requesting WeatherProg to produce digital maps. 3-D climatic data cubes (Latitude-Longitute-Time) are produced which allow queries along any of the dimension (such as slicing, dicing and trimming). The methods available for spatial interpolation are the IDW (parameterized inverse distance weithed), different flavors of kriging (ordinary, regressive), and a PRISM-like approach. [spatial interpolation].

cvSISE. Development of the cvSISE (Spatial Inference Selector Engine with cross valdation) program to automatically calculate digital maps. Any environmental quantitative variable can be potentially mapped. cvSISE runs, cross-validates and calibrates different models of spatial interpolation, and the most performing one is selected to spatially depict a (soil/environmental) property. cvSISE was also an engine to automatically produce digital soil maps within the SOILCONS-WEB (LIFE08 ENV/IT/000408) project to build the geospatial soil database, therefore cvSISE can be considered a crucial engine within geospatial DSS via web (WB-SDSS, Web-Based Spatial Decision Support System). cvSISE was firstly showed at the 5th Global Workshop on Digital Soil Mapping "*Digital Soil Assessments and Beyond …*" hosted by the University of Sydney in 2012.

FLFS. Development of a semi-automatic procedure for a fuzzy segmentation of landoforms (Fuzzy LandForm Segmentation, FLFS) as a preliminary tool to (i) produce a soil cartography / map (e.g. it was used for the soil map of Etna), (ii) design a pedological and hydraulic survey (e.g. Sangone Catchment), (iii) be included in models of spatial interpolation as soft data.

EDASS. Development of a software program with GUI called EDASS (Explorative Data Analysis with Stratification and Statistics) during my PhD. It extends the capabilities of Microsoft Access through R integration to run statistical analysis. In this way, the explorative data analysis combines the benefit of Access to perform fast queries with the advantage of running explorative and spatial statistics, accelerating data exploration thanks to fast stratification and transformation functions till the use of kriging. EDASS was extensively used to analyse the contamination by heavy metals in Lago Patria district (Caserta) within the CIVSA project, and in the preliminary geospatial analysis of different co-advised PhD thesis.

13. Personal skills and competences

LINGUE	
MOTHER TONGUE	ITALIAN
OTHER LANGUAGES	ENGLISH
• Reading skills	Excellent
• Writing skills	Good / Excellent
• Listening skills	Fluent
• Verbal skills	Good

14. Technical skills and competences

Pedometrics

Use and development of tools for digital soil mapping. The development also required tools that can perform DSM approaches in automatic fashion to be embedded in DSS web apps.

Digital soil mapping techniques include deterministic, statistical (e.g. ANNs) and geostatistical (e.g. regression kriging or Gaussian simulation) approaches.

Analysis of signals in the spatial-temporal domain by means of advanced statistical inference (e.g. neurocomputing, machine learning, fuzzy logic or harmonic regression).

Hydro-pedology

Inversion of the apparent soil electrical conductivity measured by proximal geophysical measurementsto estimate the soil electrical conductivity profile.

Knowledge, use and collaboration in the development of models simulating the infiltration of water and solute in the soil-plant-atmosphere system.

Production of soil survey schemes, also using simulated annealing.

Field description of soil profile qualitative and quantitative characteristics.

Disturbed and undisturbed soil sampling.

GIS / WebGIS

GIS elaboration by command line using the GDAL library (Geospatial Data Abstraction Library) form within (i) Unix environments, (ii) MatLab thanks to a own library

Use of the standard desktop GIS software (QGIS, SAGA, ArcGIS).

Automatic retrieval of satellite images from cloud sources to build a dedicated database used as a baseline for the production of auxiliary covariates embedded in models of spatial prediction.

Knowledge and use of GeoServer, MapStore, PostgreSQL, rasdaman.

Use of the standard OGC-compliants standards such as WCS, WCPS, WMS, WFS and so on from python environments.

Computer / programming

Excellent use of computer

- OS: Linux, Mac, Windows.
- Software: MatLab, R, PostgreSQL, rasdaman, GDAL, ESRI ArcGIS, ILWIS, SAGA, QGIS, SPSS, ISATIS, GSLIB.
- Server system administration based on Unix environment.
- Expert/experience with **WebGIS** and **web-based Decision Support Systems**.

Programming: GIT, **MatLab**, C, **CUDA**, SQL, **R**, **Python**, Java, Visual Basic.

Use of GIT for code versioning, with more than 160 repositories.

High performance computing:

- MPI (Message Passing Interface) using MatLab or C: parallel and distributed computing.
- GPGPU (General Purpose computing on Graphical Processing Units) using **CUDA-C** or the MatLab toolbox to address computing on the GPUs: according to the required granularity a MatLab code is written either using the *gpuArray()* command or using the *parallel.gpu.CUDAKernel()* context which executes externals CUDA-C kernels (such as from PTX files).

Naples, 14-June-2025

Prof. Giuliano Langella